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New Mexico's 1986 Fuelwood Harvest

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ACKNOWLEDGMENTS

We appreciate the cooperation of the following groups in supplying data for this report:

1. The owners and operators of New Mexico's primary wood processing industries.

2. The commercial fuelwood operators of New Mexico who responded to our inquiries.

3. The members of the 400 households sampled in the State who provided us data.

4. The New Mexico Energy, Minerals, and Natural Resources Department, Forestry Division; the staffs of the many Ranger Districts and National Forests in New Mexico; and the Southwestern Region, Forest Service, U.S. Department of Agriculture, for supplying us with information and referrals.

RESEARCH SUMMARY

The estimated fuelwood harvest in New Mexico in 1986 was 197,198 cords (15.5 million cubic feet). The fuelwood harvest volume was 52 percent as large as the volume of sawlogs and other industrial roundwood products harvested. The volume of live timber trees harvested for fuelwood was 5,141 cords (399,000 cubic feet), less than 1 percent of the total harvest of roundwood products in 1986.

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BACKGROUND

The Forest Survey Unit at the Intermountain Research Station is charged with making comprehensive surveys and analyses of the forest resource situation in the Rocky Mountain States (fig. 1). Periodic annual estimates and descriptions of wood harvests are part of this mission.

In 1987, harvest data for calendar year 1986 were collected for New Mexico to coincide with the forest inventory of that State. The inventory provided the data to estimate and describe the volume, growth, and mortality of the forests' trees. The harvest data are used to assess and describe the changes in the State's inventory due to logging and related activities. The fuelwood harvest, one segment of tree harvesting, is the focus of this report.

Residential use of firewood in the United States declined from 1880 until the mid-1970's (USDA Forest Service 1982). Since the 1973 oil embargo, the use of fuelwood for home heating has increased, sometimes dramatically (McLain and Booth 1985). Consequently, more elaborate data-gathering methods were used to estimate the 1986 fuelwood harvest in New Mexico than were used in previous New Mexico studies.

As in past studies, operators of primary wood processing plants, such as sawmills, were canvassed by mailed questionnaires to obtain harvest data for timber products and fuelwood. Additionally, for this study, potential commercial fuelwood operators were canvassed by mail, and households were polled by mail and telephone.

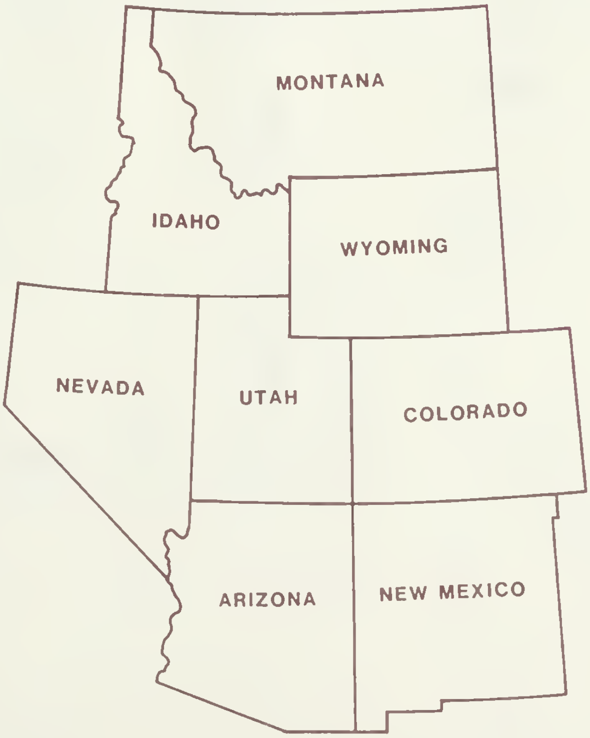

Figure 1—Rocky Mountain States.

RESULTS

In 1986 an estimated 197,198 cords of fuelwood (tables 1 to 3) were harvested in New Mexico. Applying the standard conversion rate used in New Mexico and Arizona by the Forest Service, U.S. Department of Agriculture, of 78.6 cubic feet of wood per cord, this amounts to over 15.5 million cubic feet and is equivalent to 52 percent of the 1986 New Mexico harvest of sawlogs and other industrial roundwood products (McLain 1989). Fuelwood harvest estimates were combined with posts and miscellaneous farm timbers in 1969 (Setzer 1971) and 1974 (Setzer and Barrett 1977), prohibiting a straightforward comparison of fuelwood harvests. The harvests of the combined products (posts, farm timbers, and fuelwood) for each of those years were 7.6 million cubic feet. The factors for converting cubic feet to cords are unknown.

The 1986 fuelwood harvest, though a significant proportion of total roundwood production in New Mexico, is not a significant drain on the growing-stock inventory of New Mexico's forests nor does it appear to represent much direct competition with the forest products industry for wood fiber. Most of the fuelwood harvest was dead trees, nontimber trees, or trees from nonforest lands.

The fuelwood harvest of standing live trees of timber species from forest land was 5,100 cords, 2.6 percent of the total fuelwood harvest, 1.3 percent of the roundwood harvest of live trees, and less than 1 percent of total 1986 roundwood production (fig. 2). Of the remaining 192,000 cords of fuelwood harvested, 52,000 were from dead trees of timber species, and 140,000 were from nontimber trees and trees harvested from nonforest lands.

Table 1—Fuelwood harvested in New Mexico by county, and owner or land class, 1986

	Owner or land class				
County	National Forest	Bureau of Land Management	Private	Nonforest[1]	Total[2]
			Cords		
Bernallilo	—	—	8,664	12,375	21,039
Catron	216	—	800	—	1,016
Chaves	—	—	7,425	—	7,425
Cibola	—	—	4,950	—	4,950
Colfax	—	—	2,475	—	2,475
Dona Ana	—	—	—	2,476	2,476
Eddy	1,248	—	7,425	—	8,673
Grant	19,934	—	60	—	19,994
Lincoln	1,708	—	—	—	1,708
Los Alamos	1,238	1,238	—	—	2,476
Mora	—	—	5,201	—	5,201
Otero	3,848	—	27	—	3,875
Rio Arriba	1,585	—	1,238	—	2,823
Sandoval	7,425	—	8,663	—	16,088
San Juan	5,569	1,238	—	—	6,807
San Miguel	3,164	—	49,570	—	52,734
Santa Fe	2,475	—	4,950	—	7,425
Sierra	928	—	—	—	928
Taos	9,283	—	3,712	—	12,995
Torrence	1,238	—	12,376	—	13,614
Union	—	—	1,238	—	1,238
Valencia	—	—	1,238	—	1,238
Total[2]	59,859	2,476	120,012	14,851	197,198

[1] Includes orchards, parks, urban areas, and windbreaks.

[2] Data may not sum to totals due to rounding or truncating.

Table 2—Fuelwood harvested in New Mexico by species, and owner or land class, 1986

Species	National Forest	Bureau of Land Management	Private	Nonforest[1]	Total[2]
	Cords				
True firs	3,713	—	50	—	3,763
Alligator juniper	15,285	—	8,461	1,238	24,984
Other junipers[3]	4,332	1,238	43,313	—	48,883
Spruce	6,188	—	—	—	6,188
Pinyon	5,999	619	26,423	—	33,041
Ponderosa pine	16,511	619	7,022	—	24,152
Douglas-fir	5,026	—	4,381	—	9,407
Cottonwood	—	—	9,901	—	9,901
Aspen	639	—	3,094	—	3,733
Mesquite	—	—	—	1,238	1,238
Oak	2,166	—	4,372	—	6,538
Other hardwoods[4]	—	—	12,995	12,375	25,370
Total[2]	59,859	2,476	120,012	14,851	197,198

[1] Includes orchards, parks, urban areas, and windbreaks.
[2] Data may not sum to totals due to rounding or truncating.
[3] Utah, Rocky Mountain, and one-seed junipers.
[4] Elm and poplar.

Table 3—Fuelwood harvested in New Mexico by county and species, 1986

County	True fir	Alligator juniper	Other[1] junipers	Spruce	Pinyon	Ponderosa pine	Douglas-fir	Cottonwood	Aspen	Mesquite	Oak	Other[2] hardwoods	Total[3]
	Cords												
Bernallilo	—	—	619	—	1,857	—	—	1,238	—	—	—	17,325	21,039
Catron	—	508	—	—	508	—	—	—	—	—	—	—	1,016
Chavez	—	4,950	2,475	—	—	—	—	—	—	—	—	—	7,425
Cibola	—	—	2,475	—	2,475	—	—	—	—	—	—	—	4,950
Colfax	—	—	—	—	—	—	2,475	—	—	—	—	—	2,475
Dona Ana	—	1,238	—	—	—	—	—	—	—	1,238	—	—	2,476
Eddy	—	6	1,238	—	4	—	—	7,425	—	—	—	—	8,673
Grant	—	11,857	—	—	47	6,218	—	—	—	—	1,872	—	19,994
Lincoln	—	235	—	—	1,473	—	—	—	—	—	—	—	1,708
Los Alamos	—	—	—	—	619	1,857	—	—	—	—	—	—	2,476
Mora	50	—	—	—	—	3,863	50	—	1,238	—	—	—	5,201
Otero	3,713	2	—	—	—	40	75	—	20	—	25	—	3,875
Rio Arriba	—	—	—	—	—	1,585	—	—	—	—	1,238	—	2,823
Sandoval	—	—	—	2,475	1,856	4,950	—	619	—	—	—	6,188	16,088
San Juan	—	2,475	4,332	—	—	—	—	—	—	—	—	—	6,807
San Miguel	—	—	37,125	—	15,539	70	—	—	—	—	—	—	52,734
Santa Fe	—	—	619	—	4,331	2,475	—	—	—	—	—	—	7,425
Sierra	—	619	—	—	—	—	—	—	—	—	309	—	928
Taos	—	—	—	3,713	—	—	6,807	—	2,475	—	—	—	12,995
Torrence	—	3,094	—	—	4,332	3,094	—	—	—	—	3,094	—	13,614
Union	—	—	—	—	—	—	—	619	—	—	—	619	1,238
Valencia	—	—	—	—	—	—	—	—	—	—	—	1,238	1,238
Total[3]	3,763	24,984	48,883	6,188	33,041	24,152	9,407	9,901	3,733	1,238	6,538	25,370	197,198

[1] Utah, Rocky Mountain, and one-seed juniper.
[2] Elm and poplar.
[3] Data may not sum to totals due to rounding or truncating.

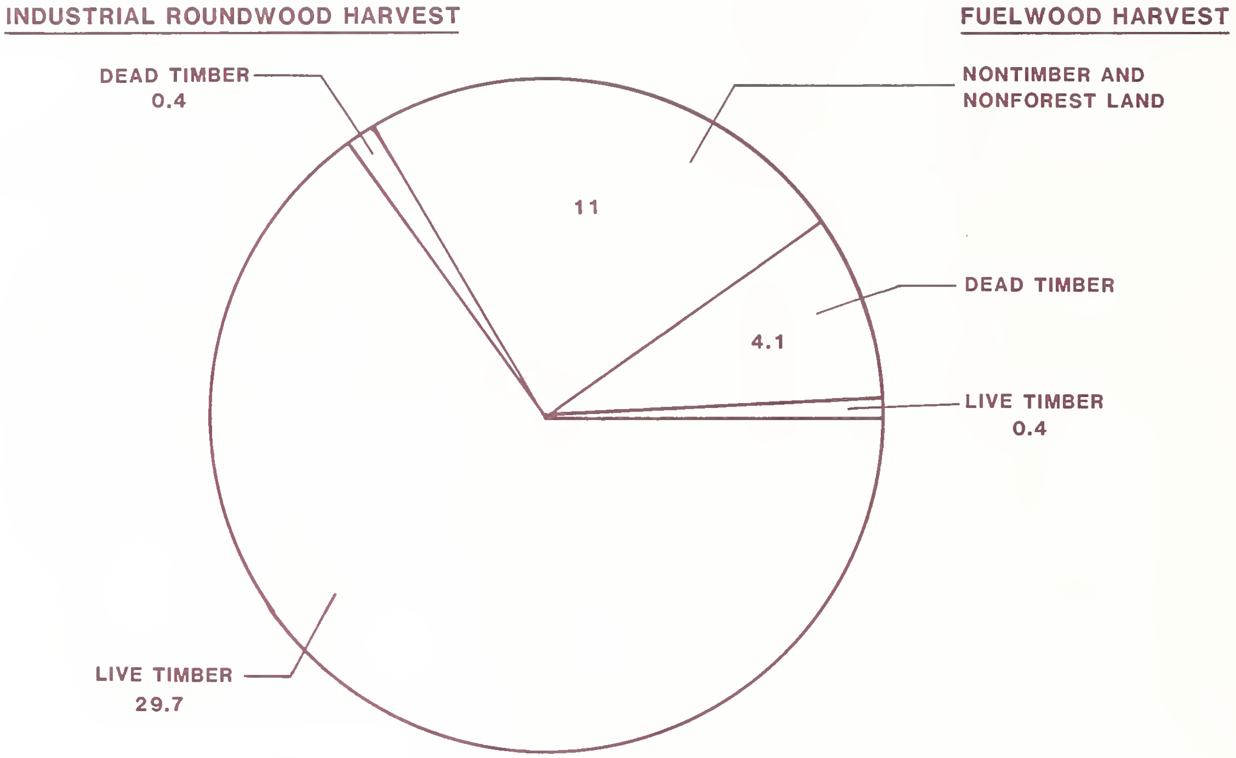

Figure 2—A comparison of the tree class composition of the fuelwood harvest and the industrial roundwood harvest in New Mexico, 1986, in million cubic feet.

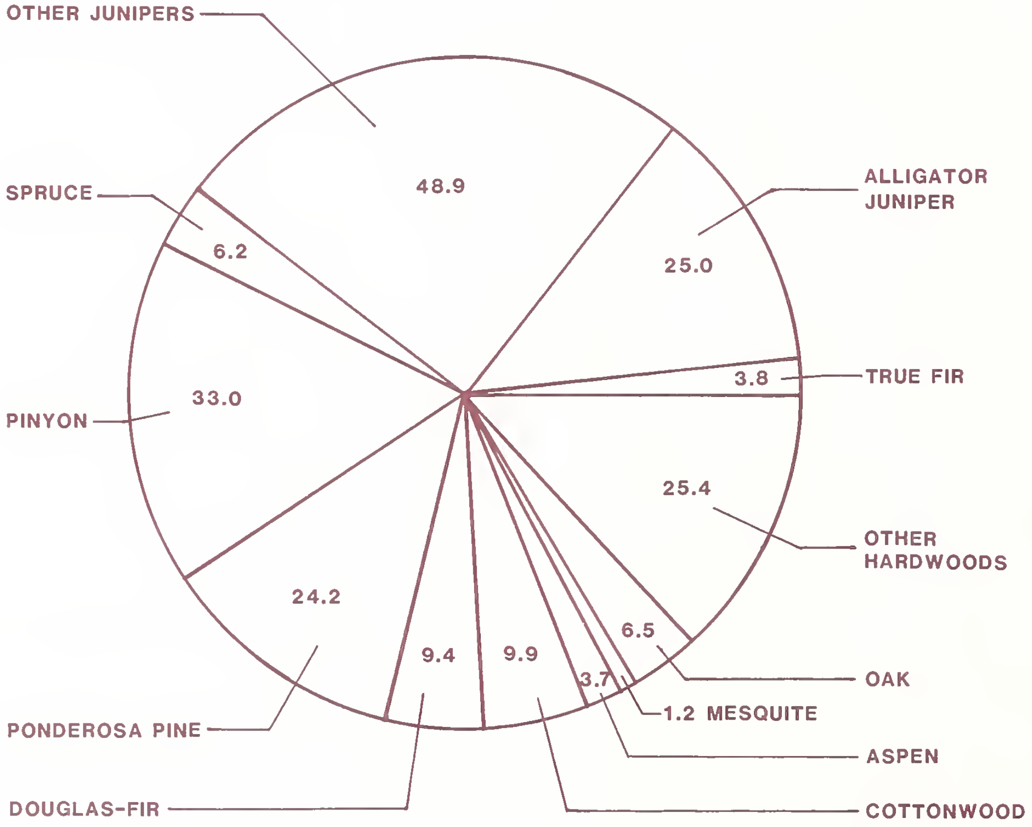

Figure 3—Species distribution of the fuelwood harvest in New Mexico, 1986, in thousand cords.

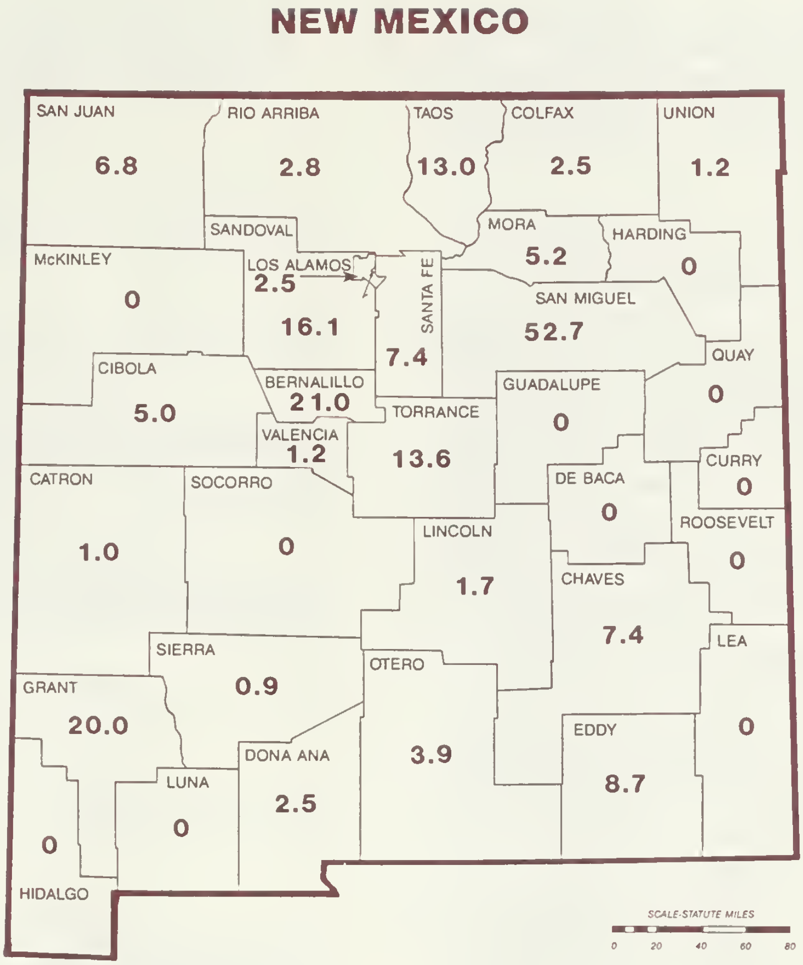

Figure 4—New Mexico fuelwood harvest by county in thousands of cords, 1986.

Of the fuelwood, 99 percent was cut for personal consumption. Commercial operators reported harvesting 2,600 cords.

Junipers represented 37 percent of the harvest with 74,000 cords cut (tables 2 and 3, fig. 3), and consisted of 13 percent alligator juniper (*Juniperus deppeana*) and 24 percent Utah, Rocky Mountain, and one-seed juniper (*J. osteosperma, J. scopulorum*, and *J. monosperma*). The junipers were followed by pinyon (*Pinus edulis*), elm (*Ulmus* sp.), poplar (*Populus* sp.), and other ornamentals and windbreak species; ponderosa pine (*Pinus ponderosa*), cottonwood (*Populus* spp.), and Douglas-fir (*Pseudotsuga menziesii*). The remainder comprised spruce (*Picea* sp.), oak (*Quercus*), true fir (*Abies* sp.), aspen (*Populus tremuloides*), and mesquite (*Prosopis* sp.).

Private lands provided 61 percent of the fuelwood harvest (tables 1 and 2), National Forests 30 percent, and lands managed by the Bureau of Land Management, U.S. Department of the Interior, 1 percent. Nonforest lands accounted for 8 percent of the fuelwood harvest.

The leading counties in fuelwood production were San Miguel with 27 percent (tables 1 and 3, fig. 4), Bernalillo 11 percent, and Grant 10 percent.

SURVEY PROCEDURES

Fuelwood harvest data were collected from two distinct groups: commercial operators who harvest fuelwood and other roundwood products to sell to consumers or retail outlets; and members of households who harvest fuelwood and consume it. These two populations were surveyed in different ways.

Fuelwood Harvest by Commercial Operators

A 100 percent canvass of commercial operators was attempted to obtain the data from this population. Commercial fuelwood operators comprised multiproduct roundwood harvesters and those who harvest strictly, or predominantly, fuelwood.

Primary wood processing plants, such as sawmills, were canvassed to obtain the multiproduct roundwood data that included fuelwood. These plants (mills and yards) were identified from "Wood Industries of New Mexico: A Guide to Wood Using Industries, 1983" updated by the

New Mexico Energy, Minerals, and Natural Resources Department, Forestry Division.

Also canvassed were individuals and businesses identified as potential commercial operators from bidders lists supplied by National Forest, Bureau of Land Management, and State forestry personnel.

Fuelwood Harvest by Members of Households for Personal Use

Personal use fuelwood harvest estimates were obtained by surveying residents of 400 households in New Mexico. The population sampled consisted of all residential listings in all New Mexico telephone books. A random number generator was used to select the sample, which was distributed throughout the telephone books in proportion to the populations of households (residences) within the books. (Copies of the program used to select the actual sample are available from Gordon D. Booth, Statistics/Computer Science Group, Intermountain Research Station.)

Of the 400 households surveyed in the State, 41 reported fuelwood harvests for 1986. The other 359 reported not harvesting.

The following procedure was used to expand the sample statistics to obtain the estimate of the total volume of fuelwood harvested by all the households in New Mexico.

n = number of households in sample

nc = number of households in sample that harvested fuelwood

$\sum X$ = reported harvest by nc in cords

$\bar{X}$ = mean harvest, in cords, by nc

$$\bar{X} = \frac{\sum X}{nc}$$

N = estimated population of residences (households) in all the telephone books in New Mexico

$$NC = N \frac{nc}{n}$$

VOL = estimated volume of fuelwood harvested by N

$$VOL = NC(\bar{X})$$

P = Bureau of Census estimate of the population of households in New Mexico

K = population adjustment factor; used to expand the estimate of harvest by the telephone books' population to the estimate of harvest by the population of New Mexico

$$K = \frac{P}{N}$$

$TOT\ VOL$[1] = estimate of the total volume harvested by members of households in New Mexico for personal consumption

$$TOT\ VOL = VOL(K)$$

or

$$TOT\ VOL = \frac{P}{n} \sum X$$

Table cells are found by merely multiplying reported volumes by the expansion factor:

$$\text{Expansion factor} = \frac{TOT\ VOL}{\sum X} = \frac{P}{n}$$

For the 1986 harvest of fuelwood by households, the following were computed:

$n = 400$

$nc = 41$

$\sum X = 159.25$

$\bar{X} = 3.88414$

$N = 385{,}942$

$NC = 39{,}559$

$VOL = 153{,}653$

$P = 495{,}000$

$K = 1.28257$

$TOT\ VOL = 197{,}072$ cords

Expansion factor = 1,237.5

The variances, standard errors, and confidence intervals of the estimates of the total volumes harvested by households are found as follows:

---

[1] This is not necessarily the volume harvested in New Mexico. Some of the fuelwood harvest reported by the population sampled took place in Colorado. These "outside" harvest volumes were included in calculations of the mean ($\bar{X}$) and are thus included in all computations involving $\bar{X}$. This does not, however, affect the calculation of the harvest volume in New Mexico.

VAR = variance of the volume harvested by the sample; computed using the number of households that harvested (*nc*)

VAR *TOT VOL* = variance of the total volume

$$\text{VAR } TOT\ VOL = \left[\frac{(\bar{X})^2(NC)(N-NC)}{n} + \frac{(NC)^2(\text{VAR})}{nc} \right] (K^2)$$

Std. error *TOT VOL* = standard error of the total volume

$$= \sqrt{\text{VAR } TOT\ VOL}$$

For 95 percent confidence interval of the estimate of the total volume:

$$TOT\ VOL \pm 2\ (\text{std. error } TOT\ VOL)$$

For the 1986 harvest of fuelwood by households, the following statistics were calculated:

VAR *TOT VOL* = 1,197,160,000 cords

Std. error *TOT VOL* = 34,600 cords

95 percent confidence interval = ± 69,200 cords (±35.1%)

TERMINOLOGY

Commercial fuelwood operators—Those who harvest fuelwood to sell to dealers or consumers. Includes loggers who harvest fuelwood along with sawlogs and other products.

Cord—A pile of stacked wood equivalent to 128 cubic feet of wood and air space having standard dimensions of 4 by 4 by 8 feet.

Forest lands—Lands at least 10 percent stocked by forest trees of any size, including lands that formerly had such tree cover and that will be naturally or artificially regenerated. The minimum area for classification of forest land is 1 acre. Roadside, streamside, and shelterbelt strips of timber must have a crown width at least 120 feet wide to qualify as forest land. Unimproved roads and trails, streams, and clearings in forest areas are classified as forest if less than 120 feet wide.

Fuelwood production—Fuelwood harvest. The fuelwood portion of roundwood production. The fuelwood volume of roundwood products.

Growing-stock volume—The net cubic-foot volume of wood in live trees from a stump 1 foot high to a 4.0-inch diameter top, outside bark. Such trees must be timber trees, those traditionally harvested for lumber products (excludes pinyon, juniper, ornamentals, and fruit trees), must have a central stem at least 5 inches in diameter at breast height (d.b.h.), and must meet specified standards of quality and vigor, thus excluding cull trees.

Industrial roundwood production—The conversion of trees into industrial roundwood products. The volume of industrial roundwood products resulting from harvest.

Industrial roundwood products, or industrial wood products, or industrial roundwood, or timber products—Includes sawlogs, pulpwood bolts or logs, houselogs, veneer logs, utility poles, building poles, corral poles, posts, excelsior bolts, ties, mine timbers, and pilings. Does not include fuelwood.

Nonforest lands—Lands not qualifying as forest lands. In this publication, references to nonforest lands mean orchards, parks, urban areas, and windbreaks.

Nontimber trees—Trees other than timber trees. Nontimber tree species are pinyon, juniper, and all hardwoods except cottonwood and aspen.

Primary wood processing industry —Generally, includes sawmills; fiber board, veneer, and plywood plants; pulp mills; houselog plants; post and pole yards; post and pole treating plants, excelsior plants; tie yards; and producers of pilings.

Roundwood production—The production of industrial roundwood and fuelwood. The conversion of trees into roundwood products. The volume of roundwood products resulting from harvest.

Roundwood products, or roundwood—Includes sawlogs, pulpwood bolts or logs, houselogs, veneer logs, utility poles, building poles, corral poles, posts, excelsior bolts, ties, mine timbers, pilings, and fuelwood. Differs from industrial roundwood products because roundwood products include fuelwood.

Timber production—Timber products; same as industrial roundwood products or industrial roundwood production. Does not include fuelwood.

Timber species—Those tree species traditionally harvested for lumber products, such as ponderosa pine, Douglas-fir, lodgepole pine, cottonwood, and aspen. Excludes pinyon, juniper, and miscellaneous hardwoods such as oaks, shade trees, ornamentals, and fruit trees.

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APPENDIX: NEW MEXICO DIRECTORY OF COMMERCIAL FIREWOOD CUTTERS

County	**Firewood cutter**
Grant	Bad Axe Wood Co. HCR 88060 #34 Coleman Rd. Silver City, NM 88061 Location: Silver City 505-388-9103 Walter Strain, Owner
Lincoln	Gonzalez Wood Box 41 Corona, NM 88318 Location: Corner of Hwy 54 and Hwy 42 505-849-8686 Juan A. Gonzalez, Owner
Lincoln	Wildcat Leasing Co. P.O. Box 248 Carrizozo, NM 88301-0248 Location: Carrizozo 505-648-2996 Bryan and Paul Wetzel, Partners
San Miguel	Sabino R. Varela Rt. 2, Box 47 Pecos, NM 87552 Location: Pecos 505-757-6205
Santa Fe	Leonard's Vigas and Firewood 1306 Isleta Ave. Santa Fe, NM 87501 505-983-8119 505-982-0316
Sierra	Lloyd Beal Box 89 Winston, NM 87943 Location: Winston 505-894-6280
Socorro	Magdalena Wholesale Firewood Co. P.O. Box 361 Magdalena, NM 87825 Location: North side of Hwy 60 - Magdalena 505-854-2718 Robert Winston, Owner

McLain, William H. 1989. New Mexico's 1986 fuelwood harvest. Resour. Bull. INT-60. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 8 p.

Highlights the 1986 harvest of fuelwood in New Mexico by commercial fuelwood harvesters and those cutting for home consumption. Presents harvest volumes by species, county, and owner. Lists a directory of commercial fuelwood harvesters and describes the methods of data collection and compilation.

KEYWORDS: fuelwood, firewood

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